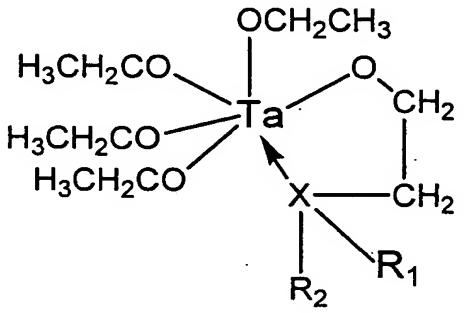
WHAT IS CLAIMED:

1. A semiconductor capacitor comprising:

a first electrode;

a second electrode; and

a tantalum oxide layer positioned between said first electrode and said second electrode, said tantalum oxide layer formed by depositing at least one precursor and ozone gas, the at least one precursor represented by the formula:



wherein X is selected from the group consisting of nitrogen, sulfur, oxygen, and a carbonyl group; and

R_1 and R_2 are independently alkyl.

2. The semiconductor capacitor according to Claim 1, wherein R_1 and R_2 are independently selected from C_1 to C_4 alkyl.

3. The semiconductor capacitor according to Claim 1, wherein R_1 and R_2 are each methyl and X is nitrogen.

4. The semiconductor capacitor according to Claim 1, wherein the first electrode comprises at least one material selected from the group consisting of polysilicon, a noble metal, and a conductive metal nitride.

5. The semiconductor capacitor according to Claim 4, wherein the noble metal is selected from the group consisting of Ru, Ir, Pt, and combinations thereof.

6. The semiconductor capacitor according to Claim 4, wherein the

conductive metal nitride is selected from the group consisting of TiN, TaN, WN, and combinations thereof.

7. The semiconductor capacitor according to Claim 1, wherein the second electrode comprises at least one material selected from the group consisting of polysilicon, a noble metal, and a conductive metal nitride.

8. The semiconductor capacitor according to Claim 7, wherein the noble metal is selected from the group consisting of Ru, Ir, Pt, and combinations thereof.

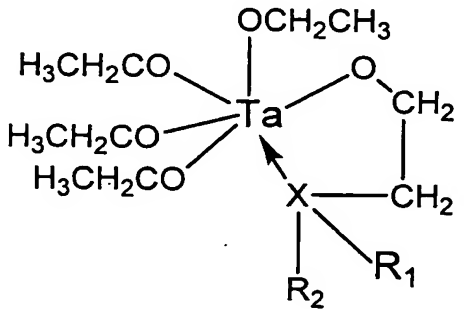
9. The semiconductor capacitor according to Claim 7, wherein the conductive metal nitride is selected from the group consisting of TiN, TaN, WN, and combinations thereof.

10. The semiconductor capacitor of Claim 1, wherein the tantalum oxide layer is deposited at a temperature ranging of from about 100°C to about 600°C.

11. A method of making a semiconductor capacitor comprising:

forming a first electrode on a semiconductor substrate; and

forming a tantalum oxide layer on the first electrode by depositing at least one precursor and ozone gas, the at least one precursor represented by the formula:



wherein X is selected from the group consisting of nitrogen, sulfur, oxygen, and a carbonyl group; and R_1 and R_2 are independently alkyl; and

forming a second electrode on the tantalum oxide layer.

12. The method according to Claim 11, wherein said step of forming a tantalum oxide layer on the first electrode comprises injecting the at least one precursor, the ozone gas and a purge gas on the first electrode sequentially.

13. The method according to Claim 11, further comprising the step of forming a tantalum preprocessed layer on the surface of the first electrode by depositing at least one tantalum precursor including oxygen bond by chemical vapor deposition prior to said step of forming a tantalum oxide layer on the first electrode.

14. The method according to Claim 13, wherein the at least one tantalum precursor is selected from the group consisting of $Ta(OC_2H_5)_5$ and $Ta(OCH_3)_5$.

15. The method according to Claim 11, wherein the first electrode comprises polysilicon, a noble metal, a metal nitride, and combinations thereof.

16. The method according to Claim 11, wherein the purge gas is argon, nitrogen, or mixtures thereof.

17. The method according to Claim 11, wherein R_1 and R_2 are each methyl and X is nitrogen.

18. The method according to Claim 11, wherein R_1 and R_2 are independently C_1 to C_4 alkyl.

19. The method according to Claim 15, wherein the noble metal is selected from the group consisting of Ru, Ir, Pt, and combinations thereof.

20. The method according to Claim 15, wherein the metal nitride is selected from the group consisting of TiN, TaN, WN, and combinations thereof.

21. The method according to Claim 11, wherein said step of depositing the at least one precursor on the first electrode occurs at a temperature ranging from about 100°C to about 600°C